action by itself (e.g., the object detects a malfunction), it will be understood that the action is actually carried out when the CPU 31 executes the corresponding program.

As shown in FIG. 3, the self-diagnosis program of the present embodiment includes malfunction detecting objects 100, a malfunction-information managing object 200, malfunction-information storing objects 300 and an MIL controlling object 400. In FIG. 3 as well as in the other drawings, each object is designated as "OBJ" for the sake of simplicity.

The objects 100-400 are programs implemented on a platform (hereinafter, simply referred as "PF") 500 and are executed upon receiving an MIL malfunction detection request (or simply referred to as "MALFUNC.DETECT.REQ.") or an MIL state renewal request (or simply referred to as "MIL STATE RENEW.REQ.") from the PF 500.

When each malfunction detecting object 100 receives the malfunction detection request from the PF 500, the malfunction detecting object 100 detects a malfunction of a corresponding diagnosis target to be diagnosed by the self-diagnosis based on the information, such as information of a corresponding sensor inputted to the engine control unit 16. Each malfunction detecting object 100 is provided for each corresponding malfunction detecting process. The PF 500 outputs the malfunction detection request at a predetermined timing that is determined depending on the diagnosis target. For example, the PF 500 may output the malfunction detection request to the corresponding malfunction detecting object 100 at predetermined

time intervals, e.g., at every 4 ms, 8 ms or 16 ms. Alternatively, the PF 500 may output the malfunction detection request to the corresponding malfunction detecting object 100 at predetermined crank angles (CA), e.g., at every 30 CA, 60 CA or 180 CA.

The malfunction-information managing object 200 receives normal/abnormal notification from each malfunction detecting object 100. Then, the malfunction-information managing object 200 sends a malfunction-information (or simply referred to as "MALFUNC-INFO.") storing notification to the corresponding malfunction-information storing object 300. When the malfunction-information storing object 300 receives the malfunction-information storing notification, the malfunction-information storing object 300 stores the malfunction information. The malfunction-information storing object 300 is provided for each predetermined malfunction check item. As described above, the malfunction detection request transmitted from the PF 500 acts as a trigger for generating the malfunction information, such as "normal", "temporarily abnormal" or "abnormal", and the malfunction information is stored for each malfunction check item corresponding to the diagnosis target.

When the MIL controlling object 400 receives the MIL state renewal request from the PF 500, the MIL controlling object 400 sends an MIL information request (or simply referred to as "MIL INFO.REQ.") to the malfunction-information managing object 200. The PF 500 outputs the MIL state renewal request at a predetermined timing that is appropriate for controlling the MIL

25.

When the malfunction-information managing object 200 receives the MIL information request from the MIL controlling object 400, the malfunction-information managing object 200 requests each malfunction-information storing object 300 to retrieve a stored control instruction for instructing a control operation of the MIL 25 (hereinafter, referred to as the control instruction of the MIL 25) corresponding to the stored malfunction information. Upon receiving the request, the malfunction-information storing object 300 outputs the control instruction (or simply referred to as "CONT.INST.") of the MIL 25 corresponding to the stored malfunction information based on the stored malfunction information. Then, the malfunction-information managing object 200 outputs the MIL information for controlling the MIL 25 to the MIL controlling object 400 based on the control instruction received from each malfunction-information storing object 300.

Then, the MIL controlling object 400 outputs an MIL response to the PF 500 based on the MIL information from the malfunction-information managing object 200 and also based on vehicle information.

That is, in the present embodiment, the MIL control operation is achieved by the process, which is triggered by the MIL state renewal request and is carried out separately from the process triggered by the malfunction detection request.

Connections between the objects 200-400 in the MIL control operation will be described in greater detail with reference to